

What is claimed is:

1           1.       A storage area network management system comprising:  
2           host computers, each comprising a storage area network management  
3 mechanism;  
4           storage devices, each comprising a storage management mechanism;  
5           switches coupled to the host computers and to the storage devices, said  
6 switches interconnecting the host computers and the storage devices, each of the  
7 switches comprising a region-setting mechanism; and  
8           an integrated management mechanism integrating and controlling the  
9 storage area network, said integrated management mechanism including access  
10 route information of the host computers and the storage devices and, based on  
11 said access route information, transmitting access management information to  
12 the storage devices and the storage area network management mechanisms of the  
13 host computers, transmitting region information to the region-setting  
14 mechanisms of the switches, and transmitting access limit information  
15 concerning the host computers to the storage management mechanisms of the  
16 storage devices.

1           2.       The storage area network management system as in claim 1,  
2 wherein the integrated management mechanism obtaining a configuration status  
3 of the storage area network from each of the storage devices, the switches, and  
4 the host computers and stores said configuration status as storage area network  
5 configuration settings information, and wherein at regular intervals, or when  
6 instructed by a system administrator, the integrated management mechanism  
7 gathers current configuration status of the storage area network, compares the  
8 current configuration status to the configuration settings information that was  
9 collected, and detects discrepancies based upon the comparison.

1           3.     The storage area network management system as in claim 1, ✓  
2     wherein the integrated management mechanism obtaining information on the  
3     access relationships from the host computer storage area network management  
4     mechanism, switches and/or the storage devices, and checking the compatibility  
5     of the access paths and, if the integrated management mechanism finds any  
6     access paths which are not set up correctly, sending out a notice about problems  
7     in a section corresponding thereto.

1           4.     Host computers in a storage area network system including  
2     storage devices and switches interconnecting the storage devices and the host  
3     computers, each of said host computers comprising:  
4         an integrated management mechanism integrating and managing the  
5     storage area network system, and establishing access information for the storage  
6     devices based on access management information transmitted to the storage  
7     devices from the integrated management mechanism.

1           5.     Switches in a storage area network system including storage  
2     devices, host computers, and an integrated management mechanism integrating  
3     and managing the storage area network system, each of said switches  
4     comprising:  
5         a region-setting mechanism carrying out the region settings based on  
6     region information transmitted by the integrated management mechanisms, said  
7     switches interconnecting the storage devices and the host computers.

1           6.     Storage devices in a storage area network system including host  
2     computers and switches, and an integrated management mechanism integrating

3 and managing the storage area network system, each of said storage devices  
4 comprising:

5 a storage management mechanism establishing conditions of access  
6 restrictions for the storage device based on access restriction information  
7 transmitted by the integrated management mechanism, said switches  
8 interconnecting the host computers and the storage devices.

9 7. An apparatus provided in a storage area network including  
10 storage devices including storage management mechanisms, host computers  
11 including storage area network management mechanisms, and switches  
12 interconnecting the storage devices and the host computers, said apparatus  
13 comprising:

14 integrated management mechanisms integrating and managing  
15 the storage area network system, transmitting access management information to  
16 the storage devices and to the storage area network management mechanisms of  
17 the host computers, transmitting region information to a switch region-setting  
18 mechanism, and transmitting access restriction information concerning the host  
19 computers to the storage management mechanisms of the storage devices.

1 8. A computer-readable medium including a program which  
2 program, when executed by a computer, causes the computer to execute the  
3 processes comprising:

4 integrating and controlling a storage area network including host  
5 computers and storage devices connected by switches through fiber channels,  
6 said processes further comprising:

7 transmitting access management information to the storage  
8 devices and storage area network management mechanisms of the host

9 computers based on the access path information of the storage devices and the  
10 host computers,  
11 transmitting region information to region setting mechanisms of  
12 the switches,  
13 transmitting access restriction information about the host  
14 computers to storage management mechanisms of the storage devices, and  
15 managing access relationships between the hosts and storage  
16 devices.

1 9. A storage area network system comprising:  
2 computers comprising a storage area network management mechanism;  
3 storage devices, each comprising a storage management mechanism;  
4 switches interconnecting the computers and the storage devices, each of  
5 the switches comprising a region-setting mechanism; and  
6 an integrated management device integrating and managing said storage  
7 area network, said integrated management device comprising access path  
8 information of the host computers and storage devices, said integrated  
9 management device transmitting access management information to the storage  
10 area network management mechanism of the host computers and to the storage  
11 devices, region information to the region setting mechanisms of the switches,  
12 and access restriction information about the host computer to the storage  
13 management mechanisms of the storage devices, wherein the integrated  
14 management mechanism detecting whether fiber channel adapters mounted on  
15 the storage devices and the host computers, the host bus adapters mounted on  
16 the host computers, or the switches in said storage area network management  
17 system are replaced, obtaining settings information following the replacement  
18 from the storage area network management mechanism of the host computers,

19 the switch region-setting mechanism, or the storage device storage management  
20 mechanism, and reconfiguring the access relationships to be equivalent to the  
21 access relationships prior to the replacement.

1 10. The storage area network system as in claim 9, wherein when the  
2 host bus adapter of the host computer fails and is replaced, the integrated  
3 management mechanism detects the replacement of the host bus adapter and  
4 notifies the system administrator, wherein if the system administrator issues a  
5 reconfigure command, the integrated management mechanism passes along the  
6 settings information from the new, replacement host bus adapter in the storage  
7 area network management mechanism of the host computer, and, using said new  
8 settings information, the integrated management mechanism configures the  
9 access relationships to be equivalent to the access relationships prior to the  
10 replacement of the host bus adapter and reconfigures the access relationships of  
11 the storage area network management mechanism, the region-setting  
12 mechanism, and the storage management mechanism.

2 11. The storage area network system as in claim 9, wherein when the  
3 host computer fails and is replaced, the integrated management mechanism  
4 detects that the storage area network management mechanism of the host  
5 computer has no settings and notifies the system administrator, and if the system  
6 administrator issues a reconfigure command which passes along to the integrated  
7 management mechanism the settings information of the connected host bus  
8 adapter, the integrated management mechanism uses that information to  
9 reconfigure the access relationships to be equivalent to the access relationships  
10 prior to the host computer replacement and then re-establishes the access  
relationships of the region-setting mechanism and the storage management

mechanism.

12. The storage area network system as in claim 9, wherein <sup>when</sup> ~~when~~ a switch fails and is replaced, the integrated management mechanism detects that the region settings information that was set up in the switch is not present and notifies the system administrator, and if the system administrator issues a reconfigure command, said reconfigure command setting the access relationships prior to the replacement in the new switch and reconfiguring the access relationships.

13. The storage area network system as in claim 9, wherein when a switch fails and is replaced, the integrated management mechanism detects that the region settings information that was set up in the switch is not present and the integrated management mechanism automatically sets up the access relationships prior to the failure in the new switch and then reconfigures the access relationships.

14. The storage area network system as in claim 9, wherein when the storage device side fiber channel adapter is replaced and the fiber channel adapter settings information is changed, the integrated management mechanism detects this and notifies the system administrator, and if the system administrator issues a reconfigure command, the storage management mechanism passes along the new settings information to the integrated management mechanism and the integrated management mechanism uses that new settings information to reconfigure the access relationships so that the access relationships are equivalent to the access relationships prior to the replacement and then re-configures the access relationships of the storage area

11 network management mechanism and the region management mechanism.

1 15. A storage area network system comprising:  
2 host computers;  
3 storage devices, each comprising a storage management mechanism;  
4 switches interconnecting the host computers and the storage devices; and  
5 an integrated management mechanism integrating and controlling the  
6 storage area network and comprising access path information of the host  
7 computers and storage devices, wherein using said access path information, the  
8 integrated management mechanism transmitting access management information  
9 to the storage devices and to the storage area network management mechanism,  
10 transmitting region information to switch region-setting mechanisms, and  
11 transmitting access restriction information concerning the host computers to the  
12 storage management mechanisms of the storage devices, wherein when the  
13 storage area network management system is started up and the access path  
14 information has not been set up, the integrated management mechanism first sets  
15 up the region-setting mechanisms of the switches so that no access is permitted  
16 and, after that, the integrated management mechanism sets up regions on the  
17 regions setting mechanisms of the switches.

1 16. A storage area network system comprising:  
2 host computers;  
3 storage devices, each comprising a storage management mechanism;  
4 switches interconnecting the host computers and the storage devices; and  
5 an integrated management mechanism integrating and controlling the

6 storage area network and comprising access path information of the host  
7 computers and storage devices and, using said access path information, said  
8 integrated management mechanism transmitting access management information  
9 to the storage devices, region information to the switch region-setting  
10 mechanisms, and access restriction information concerning the host computers  
11 to the storage management mechanisms of the storage devices, wherein the  
12 integrated management mechanism establishing specified fiber channel transfer  
13 classes using the storage area network management mechanism of the host  
14 computers whose access information has been set up, and the storage  
15 management mechanism of the storage devices such that the host bus adapters of  
16 the host computers and the fiber channel adapters of the storage devices operate  
17 using the same transfer class.

1 17. A storage area network system comprising:  
2 host computers;  
3 storage devices, each comprising a storage management mechanism;  
4 switches interconnecting the host computers and the storage devices; and  
5 an integrated management mechanism integrating and controlling the

6 storage area network and comprising access path information of the host  
7 computers and storage devices and, using said access path information, the  
8 integrated management mechanism sends out access management information to  
9 the storage devices and the storage area network management mechanisms,  
10 region information to the switch region-setting mechanisms, and access  
11 restriction information concerning the above host computers to the storage  
12 management mechanisms of the storage devices, wherein when a problem  
13 occurs in the storage area network system the integrated management



14 mechanism receives problem information and, for a specified period of time,  
15 waits to see if there are other problem reports by checking problem reports  
16 received during the specified period and investigating relationship between the  
17 received problem reports and the problem report received first, and if the  
18 integrated management mechanism determines that the received problem reports  
19 and the problem report first received are related, the integrated management  
20 mechanism transmits a single report concerning one affected area according to a  
21 problem report method definition set up in advance in the integrated  
22 management mechanism.

1 18. The storage area network system as in claim 17, wherein the  
2 storage area network system presents related problem reports that the storage  
3 area network system receives as related problems in addition to the single  
4 problem area.

1 19. The storage area network system as in claim 17, wherein in  
2 addition to the settings information for the access paths, the integrated  
3 management mechanism also obtains and stores host-side logical volume  
4 information used in the access paths from the computer storage area network  
5 management mechanism, and wherein when there is a report of a problem from  
6 within the storage area network, said access paths are used to read in the logical  
7 volume based on the access path information using said problem area, and  
8 report on the logical volumes that are affected by the problem.

1 20. A method of a storage area network system, comprising:

2 integrating and controlling the storage area network by an integrated  
3 management mechanism managing access relationships between host computers  
4 of the storage area network and storage devices of the storage area network.

1 21. The method as in claim 20, further comprising:  
2 establishing access paths between the host computers and the storage  
3 devices, said access paths being established and controlled by the integrated  
4 management mechanism.

1 22. The method as in claim 21, further comprising:  
2 controlling by the integrated management mechanism access to regions  
3 of the storage devices by the host computers.

1 23. The method as in claim 21, further comprising:  
2 establishing by the integrated management mechanism storage affinity  
3 based on the access paths.

1 24. The method as in claim 23, further comprising:  
2 establishing zoning for switches interconnecting the host computers and  
3 the storage devices of the storage area network.

1 25. The method as in claim 24, further comprising:  
2 establishing settings in storage management mechanisms of respective  
3 storage devices.

1 26. The method as in claim 20, wherein the integrated management  
2 mechanism integrates related, reported problems into a single problem report.